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ABSTRACT

This analysis of the pattern of industrial interests in the current debate over high definition television systems argues that the debate involves more than just television; rather, it is an expression of a shift in the conceptualization of the nature of standards, one which conceives of standards as guidelines for the development of specific technologies rather than merely a description of a fundamentally static set of characteristics. Focusing on the framework for analysis, the first of three parts of the paper provides some theoretical considerations and tools for analyzing the processes of standardization among the different industries involved in the debate over high resolution systems. Industrial arguments are presented in the second part, which describes both the broadcast game (including terrestrial broadcasters, satellite and cable television system operators, and some consumer electronics manufacturers) and the electronics infrastructure game (consisting chiefly of U.S.-based computer companies, consumer electronics companies, and semiconductor manufacturers, with limited telephone company participation). The findings of the study are assessed in the third part. A diagram illustrating technology/manufacturing linkages is included in the document as well as a list of the members of the Advisory Committee on Advanced Television Service. (33 references) (GL)

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INDUSTRY INTERESTS IN THE HDTV DEBATE

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Introduction

1989 is not 1965. The debate currently raging over high definition television is not a repetition of the debate that raged a quarter century ago among proponents of NTSC, PAL and SECAM. One reason for the difference is that the current players are not limited to broadcast and consumer electronic companies. Another is that the successor to the 1965 color technology was was then unknown, while the successor to today's analog technology is not only known but is already coming on stage. The only question is in what form and when it will reach the center.

This paper is an analysis of the pattern of industrial interests in the current debate over high resolution sysems.[1] To cast this issue in terms of the design of a sophisticated version of conventional television, of traditional over the air, point-tp-multipoint communication, leaves too many anomalies unexplained. Why, in that case, should representatives of computer companies testifuy before Congressional committees on HDTV? Why should representatives of the telephone industry join the US delegation to CCIR Study Group ll (HDTRV) meetings? These occurances are not unique and make no sense if HDTV is simply a matter of a refined home entertainment system.

If one shifts the boundaries of the analysis and views this debate as involving more than just television, the anomalies disappear. This debate is more than a disagreement over scanning lines, more even that a debate over field rates. Instead, it is a struggle among competing industries to define the basic concept of high resolution systems, and the winner will be in a position to define the standard most suited to its terms. This debate is also an expression of a shift in the conceptualization of the nature of standards, that is to say, it is a shift from seeing standards as a de facto or de jure description of a

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[1] The term "high resolution systems" (HRS) refers to all video systems with resolution significantly higher than that obtained with the current NTSC, PAL or SECAM systems. These systems can have commercial, educational, military or entertainment uses. Like HRS, the term "high definition television" (HDTV) or "advanced television " (ATV) refers to a video system with significantly higher resolution than current television offers, but unlike HRS, HDTV or ATV refers only to home entertainment systems.

fundamentally static set of characteristics on one hand[2] to seeing standards as guidelines for the development of specific technologies.[3]

This paper has three main parts. The first sets forth some theoretical considerations and analytic tools. The second applies the analytic model to industrial arguments, and the third assesses the findings.[4]

Part I The Framework for Analysis

This paper applies an institutional analysis (Hall, 1986, Zysman, 1983) to the processes of standardization among the different industries involved in the debate over high resolution systems. Hall defines institutions as

> "...the formal rules, compliance procedures, and standard operating practices that structure the relationship between individuals in various units of the polity and economy. As such, they have a more formal status than cultural norms but one that does not necessarily derive from legal, as opposed to conventional, standing. Throughout, the emphasis is on the relational character of institutions; that is to say, on the way in which they structure the interactions of individuals."[5]

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[2] See Marvin A. Sirbu and Laurence E. Zwimpfer, "Standards Setting for Computer Communication: The case of X.25," Center for Information Systems Research, MIT, September 1984. Sirbu and Zwimfer's distinction between a *standard* and *standardization* is useful despite the move to dynamic standards. They define a standard as a document, set of behaviors or a process, while standardization refers to the "process of developing a consensus ... that will achieve the ultimate goals of a standard, not just the production of a document. "(p. 2)

[3] Lee McKnight. HDTV and the Technopolitics of Standardization. Paper prepared for presentation at the 11th International IDATE Conference, November 15-17, 1989, p. 2. See also Kalypso Nicolaidis, "Preview - Mutual Recognition: The New Frontier of Multilateralism," in 1992: The Global Challenge, Promothee Perspectives No. 9, March 1989

[4] This analysis focuses on the interests of the major private sector actors in this debate, and, for the purpose of this study, it will not focus on, but will essentially treat as independent variables, two issue areas that are important to the overall debate over high resolution systems. One is recent developments concerning those systems in other countries, and the other is the nature and objectives of US government interests in high resolution systems. Increased understanding of both of these areas is oviously enormously important but is simply outside the scope of this present work.

[5] Peter Hall, Governing the Economy, New York: Oxford University Press, 1986, p. 19

Hall argues that institutional factors play important roles in political analysis in two ways. One is that analysis of organizational factors influences an actor's self-definition and establish institutional responsibilities and relationships with other actors. Second is that this approach permits us to

> "...see policy as more than the sum of countervailing pressure from social groups. That pressure is mediated by an organizational dynamic that imprints its own image on the outcome. Because policy-making in the modern state is always a collective process, the configuration of the institutions that aggregate the opinions of individual contributors into a set of policies can have its own effect on policy outputs. Even the degree to which that thinking is incremental rather than strategic is affected by the nature of the process...." [6]

In order to delineate the industrial interests, I will organize the analysis in terms of the Norton Long-William Dutton model of an ecology of games. This organizing tool permits patterns in the debate over high resolution systems to emerge and suggests the direction of changing relationships among games. Norton Long developed the concept of an "ecology of games" as a means of analyzing urban politics, and William Dutton applied it to his analysis of cable policy in Britain. This model is that

> "...different actors and organizations within a political system are involved in a variety of "games" in which they play a particular role in pursuit of goals and objectives defined by the game in which they are primarily involved. Games "provide a sense of purpose and a role" and "a set of strategies and tactics" for the players.... Different games are interrelated by some players simultaneously participating in different games and some players transferring from one game to another. As an example, Long suggests that the development of cities might be viewed as the outcome of a history of more or less independent games, including a real estate game, a tax game, a construction game, an insurance game and so on."[7]

Dutton argues that the strengths of this approach are that it (1) introduces elements of predictability, because apparently random actions are more sensible when seen as part of a sub-game, (2) suggests sources of stability and change in the policy process, eg., boundaries of games or changes of players, (3) "...orients research toward a broad definition of policy and the interests

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6 Peter Hall, Governing the Economy, New York: Oxford University Press, 1986, pp. 19 - 20

7 William Dutton, "The Politics of Cable Television in Britain: Policy as the Outcome of an Ecology of Games," Paper prepared for APSA, September, 1987

served by a particular policy process, ...(and) (4) points out the limitations of analyzing the behaviour of actors from any single policy perspective."[8]

The ecology of games has four explicit components: there are players (actors), who play games (the standardization process in general as well as in narrower sub-processes such as the CCIR, CCITT, etc.), that have a purpose (a specific goal or objective) one reaches via strategies. Implicit in these components is a fifth, the rationale (the fundamental purpose of the game). Analyzing the high resolution systems debate in terms of these criteria shows commonalities of interests among different industries.

Part II The Arguments

A game is a cluster of actors that (1) interact with each other over time, (2) employing or advocating similar strategies to achieve (3) a common goal. Using that definition, one can discern two primary games involving high resolution systems. They are: (1) the broadcast game, which includes terrestrial broadcasters, satellite and CATV system operators, and some consumer electronics manufacturers, and which has two phases, and (2) the electronics infrastructure game, which consists chiefly of US-based computer companies, consumer electronics companies, and semiconductor manufacturers, with limited telephone company participation. Analyzing each of these games in terms of the following questions shows significant differences in interests among the players. The questions are:

1. Who are the central players? In the private sector? In the public sector?

2. What are the fora in which which the action takes place? How does an actor get to play in the fora? Who decides? On what basis? Are there "gatekeepers"?

3. What are the strategies the players recommend for achieving the goal(s)? What are the questions the players raise? What are the reference points and frames to their arguments? What is the time frame?

4. What are the goals?

5. What is the rationale for the goals? What are the goals supposed to benefit? In the first order? In the second order?

The Broadcast Game - 1 - Setting the Stage

The first phase of the HRS debate focused fairly narrowly on high definition television *per se*. This phase dated from the beginning of the HDTV debate in

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[8] Ibid. p. 28

the late 1970's through the CCIR Plenary Meeting in Dubrovnik in May 1986. The central players were the three terrestrial broadcast networks and PBS, RCA (as a television receiver manufacturer and as the parent of RCA Labs, a site of advanced television research, and a small number of program producers and directors, most notably David Niles, Barry Rebo, and Francis Ford Coppola.

The debate took place within the Society of Motion Picture and Television Engineers (SMPTE), particularly within its Working Group on High Definition Electronic Production (WGHDEP), the newly-formed Advanced Television Systems Committee (ATSC) and the Bureau of Communication and Information Policy (CIP) at the US Department of State. The ATSC came into existence in 1983 primarily through the efforts of the members of the Joint Committee for Intersociety Coordination, whose members are the Electronics Industries Association, the Institute of Electrical and Electronics Engineering, the National Association of Broadcasters, the National Cable Television Association and the Society of Motion Picture and Television Engineers. Membership in ATSC comes from terrestrial broadcasters, cable and satellite companies, electronics manufacturers, telephone companies, motion picture companies and universities. The purpose of the ATSC is to coordinate the development of standards, develop standards, propose voluntary standards to the Federal Communications Commission (FCC) and to the American National Standards Institute (ANSI) and develop "recommended positions for the United States' use iun international standards organizations."[9]

The arguments focused on the acceptance or rejection of a 1125 scanning lines, 60 Hz interlace production standard that the Japanese Broadcasting Company had developed. The major US supporter of the system was CBS, with RCA, NBC and ABC arguing against it. The arguments centered initially on progressive versus interlace scanning and on field rates, and then primarily on the need for a single worldwide standard to facilitate international program exchange, the efficacy of 1125/60 for that purpose, and on the (small) size of the window of opportunity for setting a single worldwide standard. Thus wording of the SMPTE recommendation to the ATSC was:

> "The SMPTE WGHDEP would prefer a progressive scan standard for production, however, in the interest of achieving a world wide standard, this committee will accept a family of standards that include (sic) both 1125 line 60 Hz 2:1 interlaced and a progressive member and will continue to work towards the evaluation of preferred specifications for the progressive system."[10]

The goal was to achieve acceptance in the CCIR Plenary at Dubrovnik of the 1125/60 standard as a single worldwide standard for production and

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[9] Robert E. Hopkins, Testimony before the Subcommittee on Science, Research and Technology of the Committee on Science, Space and Technology of the US House of Representatives, June 23, 1988, p. 94

[10] SMPTE Working Group on High Definition Electronic Production, Meeting Minutes, February 17 and 18, 1985

international program exchange. The rationale was that such an agreement would benefit the US international trade in general and program producers in specific, because the United States had the leading program production industry in the world.

In March 1985, the members of the ATSC technology committee reached an uneasy consensus to support 1125/60 at the CCIR Plenary. During the ensuing fifteen months, the major US 1125/60 supporters in close connection with Diana Dougan, Director of the Bureau of Communication and Information Policy at the State Department, lobbied vigorously with the Europeans and Australians. However, the lobbying efforts were unsuccessful: the Europeans, led by officers of the European Community DG XIII in concert with representatives of Thomson, Philips and Siemans united in opposition to the US stand . The result was that the CCIR Plenary agreed to defer choice of an HDTV standard until the next (1986-90) CCIR study cycle.

The Broadcast Game - II - New Players Enter

The effect of the defeat of the US position at Dubrovnik was two-fold. One was to unravel the domestic US consensus on HDTV. NBC, RCA and ABC had gone along with the ATSC decision to support 1125 only very reluctantly, and in the letter to Diana Dougan signalling RCA's agreement, President and CEO Robert Frederick stated that RCA would resume work on a progressively scanned system if no agreement came out of Dubrovnik.[11] The second effect was to widen the broadcast game to include new players using new arguments in new fora.

The Players

A core of players from the first phase of the broadcast game carried over into the second, consisting of the three networks, PBS, and RCA Labs (transmuted into the David Sarnoff Labs). The rest, the program production community and CIP at the State Department, became much less active. The new players were (1) proponents of alternative HDTV systems, (2) CATV companies, (3) satellite broadcasters, and (4) the FCC and, to a lesser extent, the Department of Commerce and NTIA.

In addition to the NHK compatible MUSE syystem, the major proponents of alternative HDTV systems were the Del Ray Group, Faroudja Labs, MIT, North American Philips, New York Institute of Technology (NYIT), the Sarnoff Research Center, and Zenith. Of those, the Del Ray Group and NYIT were unable to have actual systems available for testing. Unlike the terrestrial broadcasters, which were deeply divided over the purpose and characteristics of an HDTV standard, the cable industry presented a more unified front. The industry had a number of representatives active in the ATSC and before Congress, but the most prominent was the NCTA chief counsel, Brenda Fox.

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11 Correspondence from Robert R. Frederick to the Honorable Diana Lady Dougan, March 1985

Likewise, Stanley Hubbard, President of Hubbard Broadcasting, most frequently represented the satellite broadcasting industry. The FCC itself became a player in the narrow sense that in 1987 it issued a Notice of Inquiry into HDTV (87-268) and established an Advisory Board on advanced television. The way the Commission framed the issues in the NOI and structured the Advisory Committee have helped shape the debate, but neither Commissioners nor staff members have argued for specific positions. Likewise, the Department of Commerce was a player, for Secretary Verity established a blue ribbon commission on advanced television in November 1988, but there were only ten (albeit highly respected) members on it, and its report was short and, more to the point, not publicized.[12]

The Fora

The most important fora for conducting the work of phase two of the broadcast game were the FCC Advisory Committee (which had its two year charter extended for an additional two years) and its working parties, the ATSC, and the soon to be operational Advanced Television Testing Center (ATTC). In addition Congressional hearings, particularly those before the House Subcommittee on Telecommunications and Finance, increasingly provided a forum for airing the players' arguments. The entrance requirements varied for each forum. Congressional testimony was also, of course, at the invitation of the Committee members of staff. For the ATSC, it was necessary to join the organization and pay a membership fee. Membership on the FCC Advisory Committee was select and by invitation, but opportunity to participate in the working parties was in fact open to all who found out about the meetings and were willing to participate in the work.

The FCC Advisory Committee on Advanced Television Service was established in October 1987 and had three subcommittees.: the Planning Subcommittee, with Joseph Flaherty of CBS as chair and the Systems and Implementation Subcommittees. Virtually all of the work to date has occurred in the Planning Subcommittees, with the following scope of activity: to take

> "all steps necessary to provide advice on desired features of a Terrestrial Advanced Television Service.

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12 The reader may notice the lack in the preceeding paragraphs of mention of the Motion Picture Association of America (MPAA) or of other organizations of major program producers. This absence has two reasons. The first is that despite obvious links between Hollywood and the television industry, with the exception of one or two individuals and of the SMPTE decisions, the motion p[icture industry has simply not been a major player in the HDTV debate. The second reason is that the industry has not taken a clear position on the issue. During the first phase of the broadcast game, prior to Dubrovnik, the MPAA endorsed 1125/60. However, it backed off from that endorsement during the spring of 1989. Moreover, the responses to a September 1989 IEEE survey of broadcast networks and producers concerning HDTV production standards showed no consensus on this issue.

(a) Define the desirable characteristics of Advanced Television Service; for example, in terms such as picture quality, population serviced, costs to broadcasters/consumers/manufacturers, relationship to existing broadcast service, and relationship to non-broadcast service.

(b) Review the technical planning factors for the existing television service and recommend planning factors for advanced television service, including consideration of factors such as coverage area, quality of service, frequency of reuse criteria, receiver quality, and spectrum allocations."[13]

To accomplish this task, the work was divided among seven working parties and two advisory groups.

The last forum important in this phase of the broadcast game is the American National Standards Institute, essentially an accrediting association for industry standards. SMPTE had submitted the 1125/60 interlace standard (known as SMPTE 240M) to ANSI for accredition. The accreditation was forthcoming. Subsequently, however, Cap Cities/ABC appealed the accreditation on the basis of lack of consensus. The ANSI appeal board found in favor of Cap Cities; when SMPTE tried to have the appeals board recind the decision, the board held its position.

Thus, while the specific objectives of the fora vary, they are all, with the exception of Congressional hearings, were designed for the development, recommendation or acceptance of a well-specified operating standard for terrestrial broadcasting.

The Arguments

The participants in this phase of the broadcast game address a common set of questions, though needless to say the answers each offers differ greatly. The questions fall into five groups: spectrum allocation, picture quality, compatibility, intermodal competition, and the role of the government.

Spectrum allocation is a cluster of issues. One is the channel size a new ATV system needs. Should the new channel be compatible with the existing 6MHz TV channels, as are the systems proposed by the Sarnoff Lab, MIT and the Del Ray Group, or should they use augmented channels or taboo channels, as MUSE 9 would necessitate?

Another spectrum issue is the choice facing the FCC to allocate new spectrum for HDTV or, alternatively, to re-allocate UHF spectrum from television to another use, primarily land mobile. Robert Wright, President of NBC,

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[13] Federal Register Vol 52, No. 200, 10/16/87, quoted in the Second Interim Report of the Planning Subcommittee of the FCC Advisory Committee on Advanced Television Service, p. 1

testifying before the Markey Committee argued that such reallocation would "...consume precious time, and leave the local station lagging far behind its cable and VCR competitors, which do not have comparable regulatory or technical spectrum-limitation problems."[14] On the other hand, Laurence Tisch, President of CBS the longtime supporter of 1125/60 and its associated (large bandwidth) transmission systems MUSE said at the same hearing, "I would not presume to prejudge the transmission standard to be selected by the FCC. CBS does however, concur with the recommenndation recently made by the FCC's advisory committee on advanced television that the FCC allocate the spectrum needed to implement a full HDTV brecadcast system....The pictures generated by high definition television are a substantial improvement and are worth the effort."[15] A cable industry variation in this argument is that cable bandwith capacity is not unlimited, because the existing cable systems have limited numbers of channels that are at present fully used.

A third spectrum argument is that the FCC should keep in mind the need to protect terrestrial broadcasting and the public interest benefits its provides.[16]

The second major set of arguments in the broadcast game centers around picture quality. One set of picture quality issues concerns technical characteristics such as scanning lines, aspect ratio, and colorimetry characteristics: should there be 787 lines (Zenith), 1050 (NBC and Sarnoff), or 1125? Should the scanning system be interlace or progressive? Assessing comparisons among these technical characteristics is the reason for the existence of FCC Advisory Committee Working Parties 6 and 7 (Psychophysical Testing and Market Research, respectively) Presumably these working party findings will weigh heavily in the deliberations of the FCC Advisory Committee.

A combination of picture and spectrum issues divides the satellite broadcasters and the cable companies from the terrestrial broadcasters. The former argue against the FCC's imposing a lowest-common demoninator standard, which would benefit the terrestrial broadcasters. Stanley Hubbard, President of Hubbard Broadcasting, said before the Markey Committee, "...we should not in any way attempt to prevent the transmission of HDTV signals by

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14 Robert C. Wright, Testimony before the Subcommittee on Telecommunications and Finance of the Committee on Energy and Commerce of the US House of Representatives, June 23, 1988, p. 233

15 Laurence A. Tisch, Testimony before the Subcommittee on Telecommunications and Finance of the Committee on Energy and Commerce of the US House of Representatives, June 23, 1988, p. 225

16 Steven Bonica, Testimony before the Subcommittee on Telecommunications and Finance of the Committee on Energy and Commerce of the US House of Representatives, October 8, 1987, p. 159

other means, just because our terrestrial television system cannot easily broadcast those programs."[17]

A third set of questions was compatibility. Should a new system be downwardly compatible with the current installed base? Representatives of ABC and NBC argue that compatibility is necessary to protect free, over-the-air television. Fred Paxton, Chair of the Association of Maximum Service Telecasters, argues that compatibility is necessary to provide local broadcasters with a means of upgrading their services in an orderly fashion, and that conversely, incompatibility would result in the "premature obsolescence" of 130 million receivers and the "demise of over 1400 local television stations." Incompatibility presents an "uniquely unpalatable scenario for a service whose life blood is its ability to reach nearly 99 percent of American households. And it presents the unpleasant public policy implication of disconnecting the poorest anmong us from the local broadcast system."[18]

A variant of the compatibility question is the concern of cable companies that the signal can come to the receiver in an unobtrusive fashion, ie., that there not be a need for a black box that sits on top of the set. Another related cable concern is that the signal be robust enough to withstand transmission over the cable system.[19]

A fourth set of issues centers on intermodal competition, particularly among among cable, satellite broadcasting and terrestrial broadcasting. For the first two, the argument here, as noted in the Hubbard quote above, is whether the FCC should require satellite broadcasters and cable companies to use the same transmission standard as terrestrial broadcasters. Should there be a single, mandatory transmission standard. Joseph Collins, President of American Television and Communications Corporation (ATC), the country's second largest cable company, argued that all "... video distribution meda should be given the same freedom and encouragement (as broadcasters) to maximize quality of their video services.... (E)ach medium should be allowed to deliver HDTV in a way that is optimal for that medium."[20]

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17 Stanley Hubbard, Testimony before the Subcommittee on Telecommunications and Finance of the Committee on Energy and Commerce of the US House of Representatives, June 23, 1988, p. 269

18 Fred Paxton, Testimony before the Subcommittee on Telecommunications and Finance of the Committee on Energy and Commerce of the US House of Representatives, October 8, 1987, p. 40

19 Brenda Fox, quoted in "High Definition Technology: The Critical Choices" Washington D.C., The Annenberg Washington Program, May 19-20, 1988, p. 14

20 Joseph Collins, Testimony before the Subcommittee on Telecommunications and Finance of the Committee on Energy and Commerce of the US House of Representatives, June 23, 1988, p. 279

The terrestrial broadcasters argue instead that a single standard is a means of saving the consumer from confusion and unnecessary expense. Robert Wright said "...if each medium goes its own way and multiple standards develop, the consequences to the consumer could be confusion, chaos and great expense. Each viewer will need multiple TV sets, one for broadcast viewing, another for cable, another for VCR, or he will need to buy one set capable of receiving all these multiple standards. All of the relevant players in mass media industries should be moving toward a consensus on a single standard."[21]

The last set of issues concerns the appropriate role for the government in this debate. The terrestrial broadcasters argue that the government needs to protect the industry from becoming second class citizens, unable to compete with other program providers that have fewer bandwidth constraints; they frame the argument in terms of localism and diversity and as a quid pro quo for broadcasters serving the public interest. The mechanism for achieving this protection is for the FCC, and possibly also Congress and the Department of Commerce, to foster the development of a single standard implemented in an orderly fashion. There is an occassional call for the government to entertain the possibility of relaxing antitruist standards (eg., Paxton, June 23). For the satellite broadcasters, the government should not foster the development of a single standard but should permit the marketplace to decide among kinds of video. For all players, the role of the FCC in allocating spectrum was an appropriate function.

Thus, the arguments in the broadcast game were fairly concrete steps aimed at promoting the health and ensuring the survival of the industrial players. The justification was the continued provision of a product the current audience wants, the protection of American consumers' investment in receivers (past and present), and the orderly development of the American television industry.

The Consumer Electronics and Infrastructure Game

On Wednesday, September 7, 1988, Congressman Edward J. Markey opened the third in a series of hearings on high definition television with a speech that placed HDTV squarely in the context of consumer electronics, industrial structure, the US trade deficit and foreign competition. This speech marks the appearance of a new game that is a serious contender to the broadcast game for control over the definition and future of high resolution systems. Despite the disparate background of the players and diffuse and still evolving fora, what gives this game coherence is that all the players view HDTV as only one facet of an advanced video system that also includes commercial, industrial, educational, military, and research uses such as workstations, high resolution systems for air traffic control and military uses, and computer aided design. Many of the players also see a US-based high resolution systems as a key component in to the future of a healthy US economy.

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21 Robert C. Wright, Testimony, June 23, 1988, p. 228

The Players and the Fora

The players in this game come from industry, notably the American Electronics Association, representing the US-based consumer electronics and computer companies, also telephone, individual computer (IBM and DEC), and occassionally, broadcast companies; from Congress, particularly the House and Senate Science Committees and House Telecommunications Subcommittee; from the Executive Branch, most notably the Defense Advanced Research Projects Agency (DARPA), the Department of Commerce, including the National Institute for Science and Technology (NIST) and of the Advanced Technology Program, the National Science Foundation; and from academic and professional associations.

The fora fall into three categories: Congressional legislation and hearings (primarily chaired by Representatives Brown and Markey), government programs and ad hoc meetings sponsored by administration bodies or by non-profit organizations.

Virtually the only extant and funded government program is the $30 million DARPA program to support dual use display and signal processing technologies for high resolution systems. Congress under the guidance of Representative George Brown created the Advanced Technology program as part of the Omnibus Trade and Competitiveness Act; however, the administration has yet to request funding. Arguably this category ought to include the Department of Commerce Advisory Committee on Advanced Television. The members of the Committee represented Gulf + Western, Zenith, AT&T, MIT, Tribune Broadcasting, SRI/International, Motorola, McKinsey, Tandy and Telecommunications Inc. (TCI), with as ex officio members, the Chair of the FCC Advisory Committee, the Director of NSF, the White House Science Advisor, and the Director of DARPA. Comparing the membership of Department of Commerce Advisory Committee on Advanced Television with the FCC Advisory Committee on Advanced Television (see Appendix 1) shows two very different constituencies.

A new forum may arise through a federal program to foster development of a domestic high-speed data network. Senator Gore has introduced legislation to spend 1.76 billion over five years to develop and interstate network that would link high performance computers for research and industrial uses. The network would have the capacity of handling three billion bits/second. The bill is reputedly moving smoothly through the legislative process

The ad hoc meetings exist to share information among the players and to design a means of building high resolution systems and strengthening the US manufacturing and high technology base. One such forum is the IEEE-USA Committees on Competitiveness and Information Policy, which held invitation only workshops that considered high resolution systems in the context of industry-led HRS consortia and of the US semiconductor industry. Another ad hoc forum is the Defense Manufacturing Board, which has held two semi-

public meetings to discuss high resolution systems with representatives of this broader group of players.

With the exception of the DARPA program, which has announced some of its awards and which has already resulted in a joint venture between Zenith and AT&T,[22] and with the possible exception of the Commerce Advisory Committee on ATV, none of the fora are mandated to produce a standard or blueprint for action.

Building on the Sematech model of an industry consortium, the American Electronics Association commissioned the Boston Consulting Group to draw up a business plan for the AEA HDTV Task Force. AEA released the plan in May 1989. The press coverage focused on the request to the federal government for $1.3 billion over ten years to support the consortium, and the reception in Congress and the administration was highly negative.

The Arguments

The players in the electronics game address four sets of issues; they are (1) what is ATV? (2) Why is a US-based ATV system important? (3) What stands in the way of creating such a system? and (4) what should the role of the government be?

What is ATV?

In testimony before the Markey Subcommittee two weeks ago, Barry H. Whalen, Senior Vice-President of the Microelectronics and Computer Technology Corporation (MCC), defined high resolution systems as "...the production, distribution, reception, processing, and display of high quality, high definition, broadband video and data for consumer, business, scientific, and military applications....The view of high definition systems merely as passive signal receptors that will give consumer a better picture on their television sets is much to limiting -- high definition systems represent key, generic technology. We must expand the view of this technology to routinely include advanced software programming."[23] In a similar vein, Russell Neuman from MIT said, "We must cease thinking of brighter colors and wider pictures and begin thinking instead of television as a mechanism for displaying a developing and evolving variety of video information on a television screen. We

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[22] AT&T hopes it will be able to supply the microelectronic devices for Zenith's HDTV sets according to Solomon J. Buchsbaum, Executive Vice-President, AT&T Bell Labs,in testimony before the US House of Representatives Committee on Energy and Commerce Subcommittee on Telecommunications and Finance, September 13, 1989

[23] Barry H. Whalen, Testimony before the Subcommittee on Telecommunications and Finance of the Committee on Energy and Commerce of the US House of Representatives, September 13,1989, p. 1

must think of television as a box with a computer inside."[24] There is broad agreement among the players in this game that advanced television will be flexible and capable of evolving over time in ways we do not yet forsee. MIT Professor William Schreiber has proposed using open architecture receivers and a "friendly family" of standards to capture flexibility. There is also a general tendency among this group to see television and computers as very closely related in terms of manufacturing and in terms of processing.

Why is a US based ATV industry important?

The central argument is that HDTV is a critical component in an electronic "food chain " (See figure 1) that extends from basic, critical materials to components, subassemblies, and integrated systems to R&D for products and for manufacturing processes. The US is currently weak in the lower, fundamental, levels of this food chain, and the weakness extends upward, to consumer electronics and also to computers and telecommunications. If the US is to overcome this weakness, it should focus on emerging technologies. Associated with this argument is need to save Zenith and Sarnoff Lans as important national assets.[25]

Advanced television is also seen as a means of creating a large market for semiconductor chips. Currently US companies and the Defense Department do not have an assured domestic supply of semiconductors. However, ATV receivers will be chip intensive, and once the penetration of ATV receivers is high, that market will create a large enough demand to drive down the price of US domestic semiconductor manufacturers, thus assuring the Defense Department of a domestic source of semiconductors at competitive prices.

A third reason for the importance of a US-based ATV system focuses on jobs. The argument is that the number of jobs associated with advanced television is irrelevant if they are all semi-skilled; what one needs to look at is the kind of jobs will high resolution systems create? Where is R&D conducted? What kind of value is added? In a related vein is the argument that a US based ATV system is important so that license fees and patent royalties do not all flow out of the country.

Thus the arguments over why ATV is important tend to refer to national security, the food chain, and to "linkages," especially to the semiconductor and computer industries.

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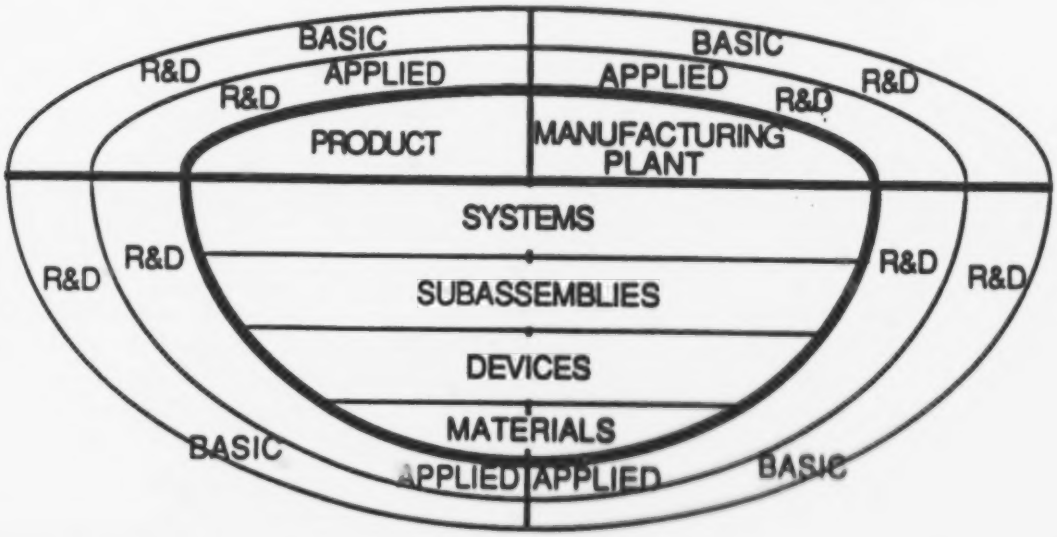
[24] Russell Neuman, et. al.,"The Genie in the Box: HDTV and the Evolving Electronic Infrastructure," Submission to the IEEE/USA workshop on the Creation of Government Industry Partnerships through the formation of American Technology Corporations, February 13-14, 1989

[25] IEEE/USA workshop on the Creation of Government Industry Partnerships through the formation of American Technology Corporations, February 13-14, 1989, pp 4-5

TECHNOLOGY/MANUFACTURING LINKAGES



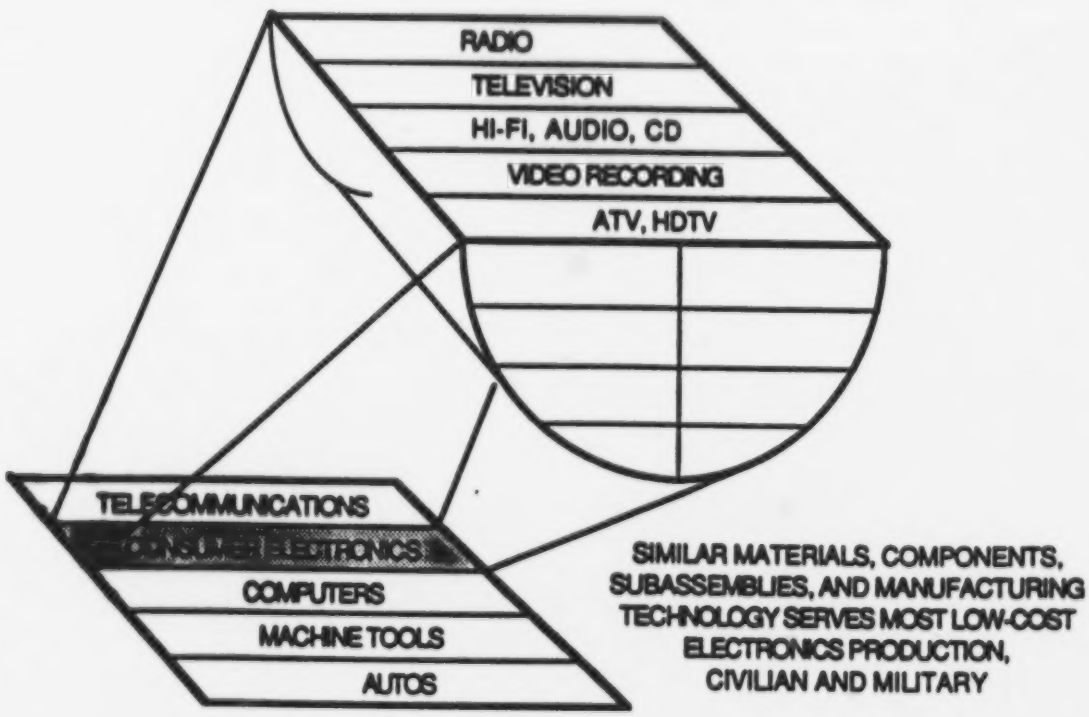


Figure 1

Source: D.H. Staelin 2/89

What stands in the way of creating a US ATV system?

The arguments concerning this question focus on the ability of US companies to compete with vertically-integrated foreign-owned companies. There are frequent references to the close cooperation between the Japanese Ministry of Posts and Telecommunications (MPT) and NHK and Sony or between MITI and high technology manufacturers. The argument is that the ministries and private sector companies create long-range plans, subsidized with public funding, to develop and promote the use of new (in this case video) technologies. On the other hand, in the United States, such cooperation between industries is illegal and between industry and government is unacceptable. Another problem is the difference is in the cost of capital (3% in Japan vs. 11% in the US).

Connected with the problem of competition with vertically-integrated foreign companies is the question of an open US market and closed foreign markets and the question of open access to US standards making procedures and consortia without foreign reciprocity.

What should the role of the US government be?

Players in the electronics game see a larger role for the US government than do the players in the broadcast game, but in all cases, the government role is to assist in an industry-led initiative. Such assistance most commonly focuses on relaxing antitrust laws for cooperative ventures, providing loan guarantees or special tax treatment to equalize capital cost differentials, and enhancing the administration's ability to enforce existing trade regulations. The IEEE called for "limited financial support, initially for selected research and development initiatives, but also possibly extending to support necessary to permit full-scale manufacturing."[26] However, the reception that greeted the American Electronics Association's request for a subsidy of $10 million a year over ten years, which would be paid back, was hostile, suggesting the inefficacy of requests for on-budget support.

The objectives in the electronics game are (1) to create an advanced video system that is flexible and extensible, that is to say capable of coping with advances in the technology at costs the mass audience will be able to afford, (2) to revitalize the consumer electronics industry, and (3) to support the supply (at competitive prices) of US semiconductors. The justification for the goals is in terms of national security, national pride (the US basically invented the industry), and playing to our strengths (by mapping on to the computer industry).

Part III Findings

Comparing the broadcast and electronics games in terms of players, fora, strategies, objectives and rationale shows stark differences in the nature of the

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26 Ibid., p. 10

games. The analysis also strongly suggests differences in the probability of the players' reaching their goals, and it highlights the importance of institutions as legitimating the standardization process.

In the broadcast game, the players are fairly homogeneous; most are companies in the business of delivering television pictures to American homes. In the electronics game, the players are less homogeneous and have a less immediate operational stake in the outcome of the debate.

The differences between the games is even clearer in terms of fora. The broadcast game takes place in well-established, unquestionably legitimate organizations (the FCC, the ATSC, SMPTE). In this regard it is interesting to note the (probably not coincidental) similarity between the name of the committee that established the current US color television system (NTSC) and the name of the industry association working on the next version (ATSC). The electronics game, on the other hand, takes place takes place primarily in ad hoc fora that have no established legitimacy. For computer companies, standardization has always been a vexatious issue: IBM has long used its dominant position to set de facto computer standards, and currently the industry is in the midst of a contentious debate over the development of open systems. For players in the electronics game, there is, therefore, a much less well-defined tradition of working out standards issues through existing organizations.

The differences between the games are also clear in the strategies and arguments and in goals. The second broadcast game players by and large argue over specific issues that can have concrete resolutions: should a system use progressive or interlace scanning? how many scanning lines should a picture have? should the new system be compatible with the installed base? Similarly the goal is clear: to establish a (transmission) standard for the next generation of US television. In the first broadcast game, the the arguments were less specific (efficacy of 1125/60 for program exchange and for Hollywood, small window of opportunity), but the goal was specific (the CCIR adoption of 1125/60 as the single worldwide production and exchange standard).

However, in the electronics game, the arguments and goals are broader and the strategies much less well-defined: revitalize the consumer electronics industry, create flexible, extensible videoo systems, safeguard the supply of US semiconductors, create new skilled jobs, establish an electronic infrastructure, create high tech industries able to compete in a global economy.

Despite the differences in size between the US broadcast industry on one hand and the computer and telecommunication industries on the other, the players in the electronics game are at a serious disadvantage in their attempt to define high resolution systems. This disadvantage springs from a lack of clear goals and specific strategies for achieving them, from the lack of an

accepted pattern of standardization, and from the lack of a widely accepted forum that legitimizes the deliberations.

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